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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,771	01/14/2004	Zheng Yuan	007443/P2	5494

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09/29/2005

Patent Counsel, M/S 2061
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EXAMINER

BREWSTER, WILLIAM M

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 09/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/757,771

Applicant(s)

YUAN ET AL.

Examiner

William M. Brewster

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– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-4 is/are allowed.
- 6) ☒ Claim(s) 5,6 and 9-23 is/are rejected.
- 7) ☒ Claim(s) 7 and 8 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>032204</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 9-11, 13-14, 17, 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Adachi et al., US Publication No. 2001/0019860 A1.

Adachi anticipates a method of forming a silicon oxide layer on a substrate, comprising:
in fig. 1B, providing a flow of a silicon-containing processing gas to a chamber housing the substrate,

providing a flow of ozone to the chamber, p. 1, ¶ 10;

causing a reaction between the silicon-containing processing gas and the ozone to form a silicon oxide layer 105, and

heating the substrate in the presence of nitrous oxide in a furnace to a temperature in the range from about 750°C to about 1000°C, p. 1, ¶ 11;

limitations from claim 10, the method of claim 9, wherein providing a flow of a silicon-containing processing gas comprises providing a flow of tetraethylorthosilicate (TEOS); and providing a flow of an oxidizing processing gas comprises providing a flow of

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ozone, p. 1, ¶ 10;

limitations from claim 11, the method of claim 9, wherein causing a reaction between the silicon-containing processing gas and the oxidizing processing gas comprises regulating the pressure of the chamber to sub-atmospheric levels, p.

1, ¶ 10;

limitations from claim 13, the method of claim 9, wherein causing a reaction between the silicon-containing processing gas and the oxidizing processing gas comprises regulating the temperature of the chamber to a range from about 400°C to about 570°C, p. 4, ¶ 47;

limitations from claim 14, the method of claim 9, wherein heating the substrate in the presence of nitrous oxide comprises heating the substrate to a temperature in a range from about 750°C to about 1000°C in a furnace, p. 4, ¶ 49.

limitations from claim 19, the method of claim 17, wherein the silicon-containing processing gas comprises tetraethylorthosilicate (TEOS), p. 1, ¶ 10.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Adachi as applied to claims 9-11, 13-14, 17, 19 above, and further in view of Wang, et al., US Publication No. 2003/0054670 A1.

Adachi does not specify a pressure in the forming of an oxide, but Wang does. Wang teaches in fig. 1 forming gap-filling oxide from TEOS and ozone with a pressure in a range from about 200 torr to less than about 760 torr, p. 3, ¶ 37. Wang gives motivation in p. 1, ¶ 10. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Wang's process with Adachi's invention would have been beneficial because it forms microelectronic layers with enhanced integrity.

Claims 15, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adachi as applied to claims 9-11, 13-14, 17, 19 above, and further in view of Boyd et al, US Publication No. 2004/0018699 A1.

Adachi does not specify using steam, but Boyd does. Boyd teaches the method of claim 15, wherein heating the substrate with oxide in the presence of nitrous oxide further comprises introducing steam into the furnace, p. 3, ¶ 34. Boyd gives motivation in p. 1, ¶ 6. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Boyd's process with Adachi's invention would have been beneficial because it enables forming gate quality BOX oxide region for SOI wafers.

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Claims 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adachi in view of Wang.

Adachi teaches a method of forming a silicon oxide layer on a substrate, comprising:

in fig. 1B, providing a flow of tetraethylorthosilicate (TEOS) processing gas to a chamber housing the substrate;

providing a flow of ozone to the chamber, p. 1, ¶ 10;

regulating the pressure of the chamber to a pressure

causing a reaction between the TEOS and the ozone to form a silicon oxide layer 105; and heating the substrate in the presence of nitrous oxide, p. 1, ¶ 11,

heating the substrate in the presence of nitrous oxide in a furnace to a temperature in the range from about 750°C to about 1000°C, p. 1, ¶ 11;

limitations from claim 21, heating the substrate in the presence of nitrous oxide in a furnace to a temperature in the range from about 750°C to about 1000°C, p. 1, ¶ 11;

limitations from claim 22, the method of claim 20, wherein heating the substrate in the presence of nitrous oxide comprises heating the substrate to a temperature greater than or equal to 850°C in a rapid thermal process for a duration greater than or equal to 1 minute, p. 4, ¶ 49.

For claim 22, Adachi does not specify greater than or equal to 1000°C. However, the practitioner may optimize this amount.

"Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art . . . such ranges are termed 'critical ranges' and the applicant has the burden of proving such criticality . . . More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

In re Aller 105 USPQ 233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmischer 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Adachi does not specify a pressure in the forming of an oxide, but Wang does. Wang teaches in fig. 1 forming gap-filling oxide from TEOS and ozone with a pressure in a range from about 200 torr to less than about 760 torr, p. 3, ¶ 37. Wang gives motivation in p. 1, ¶ 10. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Wang's process with

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Adachi's invention would have been beneficial because it forms microelectronic layers with enhanced integrity.

Claims 5, 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bose et al., US Patent No. 5,492,858 in view of Adachi.

Bose teaches a method of forming isolation structures in a silicon substrate, comprising: in figs. 1, 2, etching trenches 20, 21, 22, in the substrate 10; providing a flow of a silicon-containing processing gas to a chamber housing the substrate; providing a flow of an oxidizing gas to the chamber; causing a reaction between the silicon-containing processing gas and the oxidizing processing gas to form a silicon oxide layer 14, heating the substrate, col. 4, line 42 - col. 5, line 40; and thereafter, planarizing the layer, col. 6, lines 1-4;

limitations from claim 6, the method of claim 5, wherein planarizing the layer comprises subjecting the layer to chemical mechanical polishing, col. 6, line 1-4.

Bose does not specify using a nitrous oxide in the anneal, but Adachi does. Adachi teaches a method of forming a silicon oxide layer on a substrate, comprising: in fig. 1B, providing a flow of a silicon-containing processing gas to a chamber housing the substrate, providing a flow of ozone to the chamber, p. 1, ¶ 10;

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causing a reaction between the silicon-containing processing gas and the ozone to form a silicon oxide layer 105, and heating the substrate in the presence of nitrous oxide in a furnace.

Adachi gives motivation in p. 1, ¶ 5. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Adachi's process with Boyd's invention would have been beneficial because the oxide does not suffer from pinholes and inferior interface characteristics.

Allowable Subject Matter

Claims 1-4 allowed.

The following is a statement of reasons for the indication of allowable subject matter: although Gabric, US Patent No. 5,965,203 teaches in col. 1, lines 55-60 a variation in the oxidizing and silicon containing gas, Gabric does not contain the pressure or the nitrous oxide annealing of claim 1, lines 6-17. One of ordinary skill in the art would not be motivated to combine the other references of the prior art of record.

Claims 7, 8 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Other Prior Art

Applicants must state common assignee at time of filing application or face rejection: Gaillard et al., US Patent No. 6,875,558, Geiger et al., 6,733,955; Herner et al., 6,541,401.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William M. Brewster whose telephone number is 571-272-1854. The examiner can normally be reached on Full Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

William M. Brewster

26 September 2005
WB